

Chemistry Lesson with Project-Based Learning on the Biogas Production to Enhance Students Information Literacy

Siti Supriyanti*

Department of Chemistry Education
Universitas Pendidikan Indonesia
Bandung, Indonesia
*sitisupriyanti@upi.edu

Anna Permanasari, Fitri Khoerunnisa

Department of Chemistry Education
Universitas Pendidikan Indonesia
Bandung, Indonesia
anna.permanasari@upi.edu

Abstract—Information literacy is one of the 21st-century skills, including the ability to determine, to access, to evaluate and to use information properly and effectively from trusted sources. This study aimed to develop a chemistry learning model with the context of biogas production from waste to improve high school students' information literacy through a project-based learning model (PjBL). This study used a pre-experimental method - one group pretest-posttest design involving 32 high school students. Student's information literacy was measured using tests, while chemistry learning with project-based learning models was observed using observation sheets and learning videos. The results showed that learning with PjBL model on biogas production from waste was carried out successfully. The PjBL model on biogas production can improve student's information literacy on the medium category, with N-gain = 66.16%. Specifically, there was a significant increase in student's information literacy on indicators (1) determining valid information (N-gain 61.51%), (2) using information effectively (N-gain = 65.96%), and (3) evaluate the information used (N-gain 72.96%). These findings indicated that the PjBL model on biogas production effectively enhanced the student's information literacy.

Keywords—PjBL, information literacy, biogas, waste

I. INTRODUCTION

The Association of College and Research Library (ACRL) has established competency standards for information literacy, where information literate students are able to determine, to access, and to use information from trusted sources properly and effectively. Open access to information requires students to be able to select and to evaluate information. This ability is known as information literacy [1]. In chemistry learning, information literacy is included in 21st century skills that are expected to be developed by students through the Indonesian curriculum. These skills are skilled in using media, using technology, using information and communication [2].

Project-Based Learning (PjBL) is one of the models suggested as a learning model that can develop 21st century

skills, including information literacy. Information sources make an important contribution to the PjBL learning process. PjBL provides a way to integrate information literacy into assignments by guiding students through the research process as they work to find solutions to problems naturally. Thus, information literacy can be developed through PjBL [3].

PjBL has also been shown to enhance students' information literacy. PjBL will enhance research skills, communication skills and self-confidence. In addition, PjBL will enhance students' information literacy in processing information critically, such as in preparing research or experimental reports. PjBL creates and encourages active and collaborative learning that results in more effective and enjoyable learning. Thus, PjBL can not only develop information literacy, but also other skills such as students' critical thinking and metacognitive skills. Although weaknesses are still found, where students still access invalid or relevant information in working on projects [4-6].

Chemistry learning with PjBL on multidiscipline contexts such as biogas production from waste can enhance students' information literacy. Furthermore, the purpose of this study is to see how PjBL can enhance students' information literacy.

II. METHODS

This study used a pre-experimental method - one group pretest-posttest design involving 32 high school students. Student's information literacy was measured using tests, while chemistry learning with project-based learning models was observed using observation sheets and learning videos. The Data collection using online questionnaire, then data were analyzed statistically.

III. RESULTS AND DISCUSSION

In this study, the information literacy indicators developed were only three indicators of information literacy are determining valid literature, using information effectively, and evaluating information sources. The findings indicate a fairly

high enhancement between the pretest and posttest on all the indicators.

A. Enhancement of Information Literacy

Based on the result of data analysis, the N Gain value for each indicators of information literacy as shown in Figure 1.

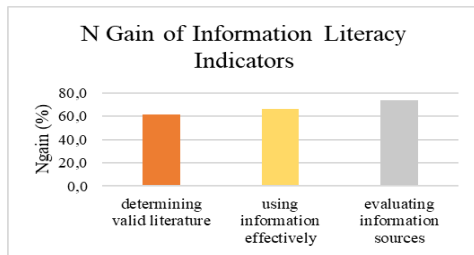


Fig. 1. N Gain chart on the information literacy indicator

The enhancement of information literacy indicators was in the medium and high categories, especially in the students' ability to evaluate information sources. This was because through this lesson, students began to recognize and using scientific literature, such as scientific articles and text books during the projects. During the project, student used and evaluated information, it was believed able to enhance student's information literacy as seen from the result. Research also shows students began to be able to select, to evaluate and to synthesize information in completing projects.

By comparing students' pretest and posttest statistically, it was found that there was a significant increase. The summary of the statistic results can be seen in Table 1. This shows that learning with PjBL in the context of making biogas from waste can enhance students' information literacy effectively.

TABLE I. WILCOXON TEST OF PRETEST AND POSTTEST ON INFORMATION LITERACY INDICATORS

Indicator	Statistic result		Inference
	Sig.	p	
Determining valid literature	0.000	0.05	significantly different
Using information	0.000	0.05	significantly different
Evaluating information	0.000	0.05	significantly different

B. Type of Student Work During the Project

Projects are carried out in groups, where each student was required to find important information needed. Each student regularly searched for information and reported their work included what they searched, what they did and the types of sources taken. The reporting results were then collected and can be seen in Figure 2.

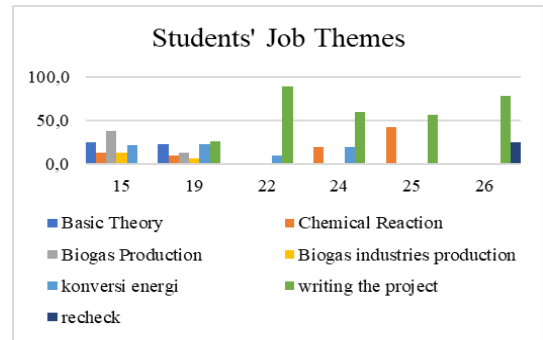


Fig. 2. Students' work time by time.

Student works in seeking information could be classified into several job themes. The students' search for the main information regarding the theoretical basis and reactions about dominant biogas was done by the students at the beginning of the project. New students start working on the assignment six days before the project was submitted.

Based on the graph, it can be seen that students mostly did the task of writing scientific papers on biogas production in the middle of the collection deadline. It is possible that at that time, students have information that was considered appropriate to the selected scientific content. This shows that students try to collect information first then selecting, assessing and finally synthesizing information into scientific work.

In finding of information, students used different sources. Based on the reports, that shown in Fig. 3, students took several sources of information and most students used other sources whose validity and reliability were still in doubt, as much as 29.2%. However, students' information literacy has increased, this is indicated by 20.4% of the information accessed is a journal or scientific article. The percentage of information sources accessed by students is shown in the diagram in Figure 3.

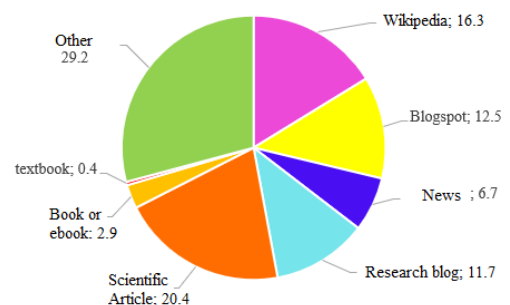


Fig. 3. Students' information sources.

The composition of journals and scientific articles in the information retrieval process by students was 20.4%, indicating that students began to become proficient in using search engines either google or other in finding information with valid sources. Information literacy learning should include practical exercises with search assignments on real-world topics that

students can relate to their academic subjects. During the lesson, students reported search strategies that included what sources were accessed.

IV. CONCLUSIONS

Through PjBL, the enhancement of students' information literacy on the medium category with the highest is evaluating information and its sources. This shows that students are starting to be trained in finding, determining and evaluating information although further improvements are still needed. Learning outcomes also show statistically significant differences, thus PjBL with the context of multidisciplinary materials such as biogas production from waste can enhance students' information literacy and have a good impact on improving students' skills in using scientific articles.

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